

**WHAT IS CLAIMED IS:**

1. A method for manufacturing a semiconductor device,  
2 comprising:

3 forming a metal gate electrode material over a semiconductor  
4 substrate, wherein the metal gate electrode material has a work  
5 function; and

6 subjecting at least a portion of the metal gate electrode  
7 material to a plasma process, the plasma process causing the  
8 portion to have a different work function.

2. The method as recited in Claim 1 further including  
2 patterning the metal gate electrode material having the work  
3 function and patterning the portion of the metal gate electrode  
4 material having the different work function to form a first gate  
5 electrode having the work function and a second gate electrode  
6 having the different work function.

3. The method as recited in Claim 2 further including  
2 forming a cladding layer over the metal gate electrode material  
3 having the work function and the metal gate electrode material  
4 having the different work function prior to the patterning, wherein  
5 the cladding layer reduces a sheet resistance of the first gate  
6 electrode and the second gate electrode.

4. The method as recited in Claim 3 wherein the cladding  
2 layer is selected from the group of materials consisting of  
3 polysilicon, molybdenum, tungsten, and titanium nitride.

5. The method as recited in Claim 1 wherein subjecting at  
2 least a portion of the metal gate electrode material to a plasma  
3 process includes subjecting at least a portion of the metal gate  
4 electrode material to a plasma nitridation process.

6. The method as recited in Claim 1 wherein the layer of  
2 gate electrode material comprises a material selected from the  
3 group consisting of molybdenum, tantalum, and tungsten.

7. The method as recited in Claim 1 wherein subjecting at  
2 least a portion of the metal gate electrode material to a plasma  
3 process includes subjecting at least a portion of the metal gate  
4 electrode material to a plasma oxidation process.

8. The method as recited in Claim 7 wherein the layer of  
2 gate electrode material comprises a material selected from the  
3 group consisting of ruthenium, iridium, osmium, indium and tin.

9. The method as recited in Claim 1 wherein subjecting at

2    least a portion of the metal gate electrode material to a plasma  
3    process includes subjecting at least a portion of the metal gate  
4    electrode material to a plasma silicidation process.

10.    The method as recited in Claim 1 wherein subjecting at  
2    least a portion of the metal gate electrode material to a plasma  
3    process includes subjecting at least a portion of the metal gate  
4    electrode material to a plasma germanidation process.

11.    The method as recited in Claim 1 further including  
2    forming a protective layer over the layer of gate electrode  
3    material and leaving the portion exposed, wherein forming the  
4    protective layer occurs prior to subjecting the portion to the  
5    plasma process.

12. A semiconductor device, comprising:

2 a first transistor located over a semiconductor substrate,  
3 wherein the first transistor has a metal gate electrode having a  
4 work function; and

5 a second transistor located over the semiconductor substrate  
6 and proximate the first transistor, wherein the second transistor  
7 has a plasma altered metal gate electrode having a different work  
8 function.

13. The semiconductor device as recited in Claim 12 wherein  
2 the first transistor is an N-channel metal oxide semiconductor  
3 device and the second transistor is a P-channel metal oxide  
4 semiconductor device.

14. The semiconductor device as recited in Claim 12 wherein  
2 the metal gate electrode is a metal and the plasma altered metal  
3 gate electrode includes the metal.

15. The semiconductor device as recited in Claim 12 wherein  
2 the plasma altered metal gate electrode is a plasma nitrided metal  
3 gate electrode.

16. The semiconductor device as recited in Claim 12 wherein  
2 the plasma altered metal gate electrode is a plasma silicided metal

3 gate electrode.

17. The semiconductor device as recited in Claim 16 wherein  
2 the metal comprises a material selected from the group consisting  
3 of cobalt, titanium, nickel and palladium.

18. The semiconductor device as recited in Claim 12 wherein  
2 the plasma altered metal gate electrode is a plasma germanided  
3 metal gate electrode.

19. The semiconductor device as recited in Claim 12 wherein  
2 the plasma altered metal gate electrode is a plasma oxidized metal  
3 gate electrode.

20. The semiconductor device as recited in Claim 19 wherein  
2 the metal comprises a material selected from the group consisting  
3 of ruthenium, iridium, osmium, indium and tin.

21. The semiconductor device as recited in Claim 12 further  
2 including a cladding layer located over the metal gate electrode  
3 and the plasma altered metal gate electrode, the cladding layer  
4 configured to reduce a sheet resistance of the first and second  
5 transistors.

22. The semiconductor device as recited in Claim 21 wherein  
2 the cladding layer is selected from the group of materials  
3 consisting of polysilicon, molybdenum, tungsten, and titanium  
4 nitride.

23. A method for manufacturing an integrated circuit,  
2 comprising:

3 forming transistors over a semiconductor substrate, including;  
4 forming a metal gate electrode material over the  
5 semiconductor substrate, wherein the metal gate electrode material  
6 has a work function;

7 subjecting at least a portion of the metal gate electrode  
8 material to a plasma process, the plasma process causing the  
9 portion to have a different work function; and

10 patterning the metal gate electrode material having the  
11 work function and patterning the portion of the metal gate  
12 electrode material having the different work function to form a  
13 first gate electrode having the work function and a second gate  
14 electrode having the different work function; and

15 forming interconnects within dielectric layers located over  
16 the transistors to form an operational integrated circuit.

24. The method as recited in Claim 23 wherein subjecting at  
2 least a portion of the metal gate electrode material to a plasma  
3 process includes subjecting at least a portion of the metal gate  
4 electrode material to a plasma nitridation process.

25. The method as recited in Claim 23 wherein the layer of  
2 gate electrode material comprises a material selected from the

3 group consisting of molybdenum, tantalum, and tungsten.

26. The method as recited in Claim 23 wherein subjecting at  
2 least a portion of the metal gate electrode material to a plasma  
3 process includes subjecting at least a portion of the metal gate  
4 electrode material to a plasma oxidation process.

27. The method as recited in Claim 26 wherein the layer of  
2 gate electrode material comprises a material selected from the  
3 group consisting of ruthenium, iridium, osmium, indium and tin.

28. The method as recited in Claim 23 wherein subjecting at  
2 least a portion of the metal gate electrode material to a plasma  
3 process includes subjecting at least a portion of the metal gate  
4 electrode material to a plasma silicidation process.

29. The method as recited in Claim 28 wherein the layer of  
2 gate electrode material comprises a material selected from the  
3 group consisting of cobalt, titanium, nickel and palladium.

30. The method as recited in Claim 23 wherein subjecting at  
2 least a portion of the metal gate electrode material to a plasma  
3 process includes subjecting at least a portion of the metal gate  
4 electrode material to a plasma germanidation process.



31. The method as recited in Claim 23 further including  
2 forming a protective layer over the layer of gate electrode  
3 material and leaving the portion exposed, wherein forming the  
4 protective layer occurs prior to subjecting the portion to the  
5 plasma process.

32. The method as recited in Claim 23 further including  
2 forming a cladding layer over the metal gate electrode material  
3 having the work function and the metal gate electrode material  
4 having the different work function prior to the patterning, wherein  
5 the cladding layer reduces a sheet resistance of the first gate  
6 electrode and the second gate electrode.

33. The method as recited in Claim 32 wherein the cladding  
2 layer is selected from the group of materials consisting of  
3 polysilicon, molybdenum, tungsten, and titanium nitride.